

Range Extensions of Some Northeast Pacific Nudibranchs

(Mollusca : Gastropoda : Opisthobranchia)

to Washington and British Columbia, with Notes on their Biology

BY

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INTRODUCTION

THERE HAS BEEN NO extensive investigation of the opisthobranchs from Washington and British Columbia since O'DONOGHUE (see his 1927 paper for bibliography) published a series of papers dealing with systematics, morphology, reproduction, color variations, and geographic distribution of species found near Nanaimo, British Columbia. Numerous papers and even a monograph (MACFARLAND, 1966) concerning the opisthobranchs of California and Baja California have been published. In particular, many papers dealing with range extensions and geographic distribution of opisthobranchs have been published recently (BERTSCH, 1969; GOSLINER & WILLIAMS, 1970; LANCE, 1961, 1966; LONG, 1969; ROLLER, 1970; ROLLER & LONG, 1969; SPHON & LANCE, 1968; STEINBERG, 1963; and others), but these deal with species found in California. Often, they only incidentally include the 'total' geographic range which may or may not include Washington, British Columbia, and Alaska, and which may be incomplete.

Over the past 5 years, while collecting nudibranchs from the intertidal and subtidal (with SCUBA) in the Washington and southern British Columbia area, I have found a number of species that have not previously been reported from the area. The range extension in almost all cases is at least from San Francisco Bay or Monterey Bay, California, to San Juan Island, Washington, a straight line distance of about 800 statute miles. A few other species have been reported in the literature (*e. g.*, HURST, 1967), but the range extensions have been omitted by the above listed authors.

The range extensions plus brief notes, where appropriate, on feeding, reproduction, color and morphological variation, depth range, and assorted miscellanea are the subject of this paper. Undoubtedly, as more biologists

Geographical Locations in Washington and British Columbia

Location	Longitude	Latitude
Alki Point, Seattle, Washington	122°24'36"	47°34'10"
Bamfield, Barkley Sound, Brit. Columbia	125°08'45"	48°50'25"
Muchalat Arm, British Columbia	126°18'	49°40'
Mukkaw Bay, Washington	124°40'	48°19'15"
Nanaimo, British Columbia	123°57'	49°12'
Saltspring Island, British Columbia	123°33'	48°45'
San Juan Island, Washington	123°05'	48°30'
Umatilla Reef, Washington	124°47'	48°11'
Victoria, British Columbia	123°23'36"	48°24'48"

become interested in the opisthobranchs from Washington and British Columbia, and especially in those on the open coast where relatively little collecting or research has been done, the range of some species will be extended, new species will be discovered, and interesting new or confirmatory observations on their natural history will be made. It is hoped that this paper and others in this projected series will help to stimulate this interest.

NEW RANGE EXTENSIONS

Ancula pacifica MacFarland, 1905

LANCE (1961) reports this species from as far south as Point Loma, California, and BEHRENS (1971) found it to be relatively common in San Francisco Bay in the summer. On June 10, 1967 and May 21, 1969, I found 2 animals, 10 and 7 mm long respectively, in the intertidal on San Juan Island, Washington.

Neither specimen exhibited the orange or yellow line on the indistinct pallial ridge, between the extrabranchial

papillae, on the caudal crest, or on the midline of the dorsum which MACFARLAND (1966) describes. The yellow pigment is present in the rhinophores, the accessory rhinophore papillae, the branchiae, and the extrabranchial papillae. The animals match MACFARLAND'S (1966) description in all other respects.

Cadlina modesta MacFarland, 1966

BERTSCH (1960) reports that the species occurs from La Jolla, California to Moss Beach [San Mateo County], California. I have collected at least 30 animals from Nainimo, Bamfield, and in Muchalat Arm, all on Vancouver Island, and from San Juan Island, Washington. Most were seen between December and August. All the animals have been on a rocky substratum from the intertidal to over 50 m, usually near sponges which they probably eat. Most of the nudibranchs were 15 - 25 mm long, although a few were up to 45 mm long. No egg masses or copulating pairs were seen in the field.

Catriona alpha (Baba & Hamatani, 1963)

LANCE (1966) reports the species from Mission Bay, Newport Bay, and Santa Barbara in California, and from Japan. I collected many animals in late May, 1969 and 1970 on San Juan Island and a few in early July, 1970 at Victoria. They were on floats or on gravel substratum to depths of 25 m. The principal prey, both on the floats and in the sublittoral, is the hydroid, *Tubularia marina* Torrey, 1902 and *Tubularia* sp. Only a few were apparently feeding on other hydroids such as *Obelia* sp. and *Syncoryne eximia* (Allman, 1859) on the floats. *Catriona* is very difficult to see when it is on the hydranth of *Tubularia* or among *Syncoryne* polyps due to the red color of the digestive diverticula in the cerata.

Numerous eggs were present in May, 1970, usually on the stalks of *Obelia* and *Tubularia*. The size range of *Catriona* was 5 - 13 mm long, but those less than about 6 - 7 mm long apparently were not sexually mature as they were not observed to copulate or spawn.

Dirona aurantia Hurst, 1966

HURST (1966) collected *Dirona aurantia* from Orcas Island, Blakely Island, and San Juan Island from floats and to depths of 30 fathoms. Although the range extensions are not very significant (less than 80 miles), I have collected *D. aurantia* as far south as Alki Point, Seattle, north to Saltspring Island, and west to Victoria. It is relatively common on floats and piles, and on gravel-shell bottoms to at least 60 m.

A few small specimens (less than 30 mm long) may be present from May through August, but the majority of

the population is seen between September and April. Some specimens grow as large as 120 mm long, but most mature ones are 50 - 80 mm long. In the field, eggs are seen from January to April and occasionally May. HURST (*op. cit.*) lists hydroids, bryozoans, amphipods, and plant material as components of the diet of *Dirona aurantia*. As a result of extensive field observations and examination of fecal pellets of freshly collected animals, I conclude that the major component (about 75%) of the diet is one or more species of arborescent bryozoans (*Bugula* sp. or *Flustrella* sp., or both) which are abundant wherever *D. aurantia* has been collected. Amphipods, hydroids, tunicates, polychaetes, etc., are part of the epifauna that lives on these bryozoans and are ingested more or less fortuitously.

Eubranchus (= *Capellinia*) *rustyus* (Marcus, 1961)

San Francisco Bay, California and Bahía de los Angeles in the Gulf of California mark the presently known northern and southern limits, respectively, of the range of *Eubranchus rustyus* (LANCE, 1961; ROLLER & LONG, 1969). This species is very common in the San Juan Archipelago, Washington, and was found in abundance at Bamfield, British Columbia in June 1970.

In the San Juan Archipelago, *Eubranchus rustyus* is a spring-summer species, being most abundant from April through September. A few were present in March and October, but none were seen from November through February. The animals, found on floats and to depths of 20 m, are almost always on or near the hydroid *Plumularia lagenifera* Allman, 1885. Like *E. olivaceus* (O'DONOGHUE, 1922), *E. rustyus* is gregarious, there often being 10 - 50 animals on a single hydroid colony. As *Plumularia* may be abundant in large patches (up to 200 m² at least), it is not uncommon to find thousands of *E. rustyus* at one time.

Eggs are deposited from April through early October on the *Plumularia*. The length of larval life is not known, but after metamorphosis, *Eubranchus rustyus* takes about 3 - 5 weeks to become sexually mature (6 - 10 mm long). Animals up to 25 mm long have been collected but most were 8 - 15 mm long.

The color pattern of *Eubranchus rustyus* in the San Juan Islands is slightly different from that described and shown by MACFARLAND (1966: p. 323; plt. 62) for *E. occidentalis* (a junior synonym of *E. rustyus*; see ROLLER, 1970). There are few flecks of green on the body; rather, there are numerous rusty-brown patches scattered over the sides, dorsum, and cerata. In some animals, these patches are dense enough to form a conspicuous brown line between the cerata on the dorso-lateral margin of the body (see also MACFARLAND, 1966). There are a few

white patches sparsely scattered on the dorsum of some specimens, but very few of the tiny yellow spots mentioned by MACFARLAND (*op. cit.*) were seen. The tips of the cerata and rhinophores may be sparsely to densely covered with flecks of opaque white pigment. About halfway up, there is an indistinct band of white flecks encircling the cerata and just distal to this, there is an indistinct band of rusty-brown flecks. There is also a band of rusty-brown pigment on the distal half of the rhinophores and oral tentacles of most animals.

Precuthona divae Marcus, 1961

This species has been found from Dillon Beach, California (STEINBERG, 1963) to Santa Barbara County, California (SPHON & LANCE, 1968). Five animals, ranging in length from 10 to 30 mm, were collected from San Juan Island, Washington, between August and October, 1969. Two were at a depth of 20 m on a rock wall covered with hydroids: *Garveia annulata* Nutting, 1901; *Tubularia* sp.; *Abietinaria* spp.; and others. The other 3 were at 10 m on a mud bottom where the only prey species was *Tubularia* sp.

At both places, I found egg masses in August. The white ribbon, deposited in a tight spiral, is similar to that of *Acanthodoris hudsoni* MacFarland, 1905 (see HURST, 1967, fig. 2), except that the free edge is even more fluted. Two of these egg masses were infested with the egg-sucking sacoglossan, *Olea hansineensis* Agersborg, 1923. *Trinchesia* (= *Cratena*) *abronia* (MacFarland, 1966)

So far, *Trinchesia abronia* has only been reported from Monterey to Pismo Beach, California (ROLLER & LONG, 1969). One specimen, 10 mm long, was collected at Mukkaw Bay on the Olympic Peninsula of Washington by Pamela Roe and brought to me for identification. It fits exactly the description given by MACFARLAND (1966) for this species. No other specimens have been collected to date.

RANGE EXTENSIONS IN HURST (1967)

HURST (1967) listed range extensions for 6 species [*Austrodoris odhneri* MacFarland, 1966; *Catriona aurantia* (Alder & Hancock, 1842); *Chelidonura phocae* Marcus, 1961; *Cratena albocrusta* MacFarland, 1966; *Cumanotus beaumonti* (Eliot, 1908); *Onchidoris muricata* (Müller, 1776)] to the San Juan Islands from various areas in California and from the Atlantic. *Chelidonura phocae*, as listed by Hurst, is almost surely *Aglaja ocelligera* (Bergh, 1894) (Larry Andrews, personal communication), which is very common in sheltered bays in Washington and

southern British Columbia (author's unpublished observations).

Archidoris (= *Austrodoris*) *odhneri*

ROLLER & LONG (1969) limit the northern range of this species to Monterey, apparently having overlooked the range extension in HURST (1967). Besides being very abundant in the San Juan Islands (author's unpublished observations), *Archidoris odhneri* is found at Nanaimo and Bamfield in British Columbia, and at Umatilla Reef on Washington's west coast. It occurs on floats and on rock or gravel substrata to at least 60 m, and is present throughout the year.

Although most mature animals are from 50 to 100 mm long, a few individuals up to 130 mm long have been seen. Copulating pairs and egg masses are present throughout the year, although never in abundance. *Archidoris odhneri* is a relatively unspecialized sponge predator, preying on: *Halichondria panicea* (Pallas, 1766); *Stylissa stipitata* de Laubenfels, 1961; *Tedania* sp.; *Syringella amphispicula* de Laubenfels, 1961; *Craniella* sp.; a hexactinellid sponge, possibly *Rhabdocalyptus* sp.; and at least 2 other unidentified species.

Although *Archidoris odhneri* is usually white, occasionally a specimen that is cadmium yellow (Grumbacher oil color chart) is found. That these yellow ones are *A. odhneri* is substantiated by the fact that they copulate with the white ones and produce viable veligers.

Trinchesia (= *Cratena*) *albocrusta*

ROLLER & LONG (1969) list the range as being from Monterey to Santa Barbara, California. However, HURST (1967) extended the range to the San Juan Islands, although she used MacFarland's genus name. I have not collected this species from Washington or British Columbia to date.

One other species, *Acanthodoris brunnea* MacFarland, 1905, deserves mention. According to ROLLER & LONG (1969), *A. brunnea* is restricted to the Monterey-Santa Barbara region in California. There are a number of references to its occurrence in the San Juan Islands and at Nanaimo, British Columbia (MACFARLAND, 1966; O'DONOGHUE, 1926; HURST, 1967). I have found a number of specimens up to 25 mm long in the winter months from the intertidal to 30 m in the San Juan Islands and at Victoria, British Columbia.

SUMMARY

The geographic range of 6 species [*Ancula pacifica* MacFarland, 1905; *Cadlina modesta* MacFarland, 1966; *Cat-*

rona alpha (Baba & Hamatani, 1963); *Eubranchus rustyus* (Marcus, 1961); *Precuthona divae* Marcus, 1961; *Trinchesia abronia* (MacFarland, 1966)] is extended from central-southern California to San Juan Island, Washington. The range of *Dirona aurantia* Hurst, 1966 is extended from the San Juan Archipelago to most of Puget Sound and the southern British Columbia area. The occurrence of *Archidoris odhneri* (MacFarland, 1966), *Trinchesia albocrusta* (MacFarland, 1966), and *Acanthodoris brunnea* MacFarland, 1905 in the San Juan Islands or southern British Columbia, or both, is reiterated.

Where known, observations on prey, reproduction, depth range, and color and morphological variation of these species are presented.

ACKNOWLEDGMENTS

I am grateful to Larry Andrews and Richard Roller for advice and confirmation of identifications of various species; to numerous people at Friday Harbor Laboratories and University of Washington, Department of Zoology for both opisthobranchs and information concerning their natural history; and to Dr. Robert Fernald, Director, Friday Harbor Laboratories, for the use of the facilities at the Laboratories, where most of the work has been done.

The support of the Ecology Training Grant to the Department of Zoology, University of Washington (NSF no. GB6518X and GB20978) and a National Research Council of Canada Postgraduate Scholarship is gratefully acknowledged.

Literature Cited

- BEHRENS, DAVID W.
1971. The occurrence of *Ancula pacifica* MacFarland in San Francisco Bay. *The Veliger* 13 (3): 297-298
(1 January 1971)
- BERTSCH, HANS
1969. *Cadlina modesta*: a range extension, with notes on habitat and a color variation. *The Veliger* 12 (2): 231-232; 1 text fig. (1 October 1969)
- GOSLINER, TERENCE M. & GARY C. WILLIAMS
1970. The opisthobranch mollusks from Marin County (California) (Gastropoda). *The Veliger* 13 (2): 175-180; 1 map
(1 October 1970)
- HURST, ANNE
1966. A description of a new species of *Dirona* from the North-East Pacific. *The Veliger* 9 (1): 9-15; plt. 2; 7 text figs. (1 July 1966)
1967. The egg masses and veligers of thirty Northeast Pacific opisthobranchs. *The Veliger* 9 (3): 255-288; pls. 26-38; 31 text figs. (1 January 1967)
- LANGE, JAMES ROBERT
1961. A distributional list of southern California opisthobranchs. *The Veliger* 4 (2): 64-69 (1 October 1961)
1966. New distributional records of some northeastern Pacific Opisthobranchiata (Mollusca:Gastropoda) with descriptions of two new species. *The Veliger* 9 (1): 69-81; figs. 1-12 (1 July 1966)
- LONG, STEVEN J.
1969. Two new records of *Cratena abronia* MACFARLAND, 1966 (Nudibranchia: Eolidacea). *The Veliger* 11 (3): 281
(1 January 1969)
- MACFARLAND, FRANK MACE
1966. Studies of opisthobranchiate mollusks of the Pacific Coast of North America. *Mem. Calif. Acad. Sci.* 6: xvi + 546 pp.; 72 pls. (8 April 1966)
- O'DONOGHUE, CHARLES HENRY
1926. A list of nudibranchiate mollusca recorded from the Pacific Coast of North America, with notes on their distribution. *Trans. Roy. Canad. Inst.* 15 (2): 199-247
1927. Notes on a collection of nudibranchs from Laguna Beach, California. *Journ. Entomol. Zool. Pomona Coll.* 19: 77-119
- ROLLER, RICHARD A.
1970a. A list of recommended nomenclatural changes for MacFarland's "Studies on opisthobranchiate mollusks of the Pacific Coast of North America." *The Veliger* 12 (3): 371 to 374 (1 January 1970)
1970b. A supplement to the annotated list of opisthobranchs from San Luis Obispo County, California. *The Veliger* 12 (4): 482-483 (1 April 1970)
- ROLLER, RICHARD A. & STEVEN J. LONG
1969. An annotated list of opisthobranchs from San Luis Obispo County, California. *The Veliger* 11 (4): 424-430; 1 map (1 April 1969)
- SPHON, GALE G., JR. & JAMES ROBERT LANGE
1968. An annotated list of nudibranchs and their allies from Santa Barbara County, California. *Proc. Calif. Acad. Sci.* 36 (3): 73-84; 1 fig. (25 September 1968)
- STEINBERG, JOAN EMILY
1963. Notes on the opisthobranchs of the west coast of North America. — IV. A distributional list of opisthobranchs from Point Conception to Vancouver Island. *The Veliger* 6 (2): 68-73 (1 October 1963)